

A STUDY OF ACADEMIC PREPARATION OF BIOLOGY AND
GENERAL SCIENCE TEACHERS IN RELATION
TO SCHOOL SIZE IN KANSAS
1963-64

by

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THE PROBLEM AND DEFINITIONS OF TERMS USED

The academic preparation of science teachers is a subject that is the object of many studies for many different purposes. This study was made to investigate the academic preparation of the secondary biology and general science teachers in Kansas.

The Problem

Statement of the problem. The purpose of the study was (1) to determine the number of college credits in biology and in the science field for the secondary biology and general science teachers in Kansas in 1963-64 and (2) to compare the academic preparation to the size of school in which they teach.

Need for the study. In a time such as this when much emphasis is being placed upon science in our society, a high school graduate without an understanding of the major concepts of science would be in effect culturally illiterate.¹ With this realization in recent years, society has become increasingly interested in the education of high school science teachers.

Studies that include the academic preparation of

¹Paul De H. Hurd, "Science Teachers for a New Era in Science," California Journal of Secondary Education, 33:486-7, December, 1958.

Kansas secondary teachers pre-date the current concern for proper science education. Ridgeway² in 1931, Irwin³ in 1938, and Lockard⁴ in 1946 made such studies and noted that a large number of science teachers were not properly prepared for their teaching assignment.

More recently, in 1957 Brooks and Baker⁵ reviewed the academic preparation of high school science teachers. It would seem that in the light of the current school consolidation legislation that is certain to affect the small schools, and the present national emphasis on science, this study should prove beneficial, proving or disproving some assumptions regarding secondary biology and general science teachers, especially in small high schools.

²C. W. Ridgeway, "A Comparative Study of the Training and Teaching Combinations of Kansas High School Teacher," Kansas State Teachers College Studies in Education, No. 5, 1-31.

³Frank L. Irwin, "A Comparative Study of the College Preparation. Teaching Combinations, and Salaries of Kansas High School Teachers, (1938)." Kansas State Teachers College Bulletin of Information, No. 18, 1-38.

⁴Gene K. Lockard, "A Comparative Study of the College Preparation. Teaching Combinations and Salaries of Kansas High School Administrators and Teachers, (1946)." Kansas State Teachers College Bulletin of Information, No. 26, 1-38.

⁵Weldon N. Baker and Merle E. Brooks, "Background and Academic Preparation of the Teachers of Science in the High Schools of Kansas 1955-56," The Emporia State Research Studies, No. 6, 1-40.

Definitions of Terms Used

Full time biology teacher. This person teaches four or more classes of biology, botany, zoology, anatomy, or physiology or a combination of these subjects during the school day.

Part time biology teacher. This person teaches less than four classes of the above mentioned subjects and may teach other subjects such as general science, or non-science courses for the remainder of the school day.

Full time general science teacher. This person teaches four or more classes of general science, earth science, physical science, basic science, senior science, or lab science or a combination of these subjects during a school day.

Part time general science teacher. This person teaches less than four classes of the above mentioned general science courses and may teach biology or non-science courses for the remainder of the school day.

Credits. These are the number of semester hours earned during college preparation.

Science field. This includes the total of all college credits earned in chemistry, physics, biology, and earth science. Mathematics credits are not included

in the science field.

Qualification to teach. This is based on the requirements of the Kansas State Board of Education as stated in the Certification Handbook of July 1, 1963 which go into effect September 1, 1965. Standard requirements will be twenty-four semester hours in the field of science with a minimum of twelve semester hours in the subject taught. Minimum requirements will be eighteen semester hours in the field of science with a minimum of ten semester hours in the subject taught.⁶ Current minimums are fifteen semester hours in the field of science with five semester hours in each subject taught.

Secondary schools. All the junior and senior high schools listed in the Principals Organizational Reports for 1963-64 and a file at the State Department of Education, Topeka.

Limitation of the Study

The study was limited to the part and full time biology and general science teachers in the secondary schools of Kansas.

⁶Kansas State Board of Education, Certification Handbook, (Topeka: State Board of Education, 1963), p. 65.

Procedure

The study was based on information concerning the secondary part and full time biology and general science teachers, which was taken from the 1963-64 High School Principals Organizational Reports on file at the State Department of Public Instruction. The writer accepted the accuracy and judgment of the principal or whomever was responsible for recording the correct credits for the teachers in the proper place on the organizational reports. In a few cases when the credits or other information was missing or not clear, the transcripts, also on file at the State Department, were studied.

The data recorded by the writer pertaining each teacher were names and numbers of each class taught, number of credits in biology, number of credits in the science field, last academic degree earned, and enrollment of the school in which he taught.

In 1963-64 a total of 1,210 instructors were teaching biology or general science in the secondary schools of Kansas. The writer was unable to obtain accurate information for the preparation of twenty teachers, therefore, records of 1,190 teachers were studied.

REVIEW OF THE LITERATURE

The concern of educators and others in our society

relative to the academic preparation of secondary science teachers is reflected by the volume of material that has been and is being written dealing with the subject. The literature contains problems, solutions, plans, and suggestions; all written with the ultimate welfare of the students in mind. This is exemplified by one state science committee that suggested that it might be better for a school to drop a science course than to continue it with an untrained teacher.⁷

In 1949, Cahoon quoted the President's Scientific Research Board on Manpower for Research, and mentioned the following recommendations in regard to the pre-science training of secondary school science teachers:

(a) Certification should be in closely related subjects within the broad area of science and mathematics.

(b) Approximately one-half the program or sixty semester hours should be allotted to the comprehensive teaching area of science and mathematics.

(c) Every teacher of science should complete the basic courses (six to ten semester hours each) in biology, chemistry and mathematics and physics.

(d) A minimum of eighteen semester hours of study should be required for certification in a particular subject.

(e) The comprehensive area should include study beyond the basic course in at least two and preferably three of the sciences (the other sixty semester hours will allow for

⁷Hurd, op. cit., p. 491.

eighteen hours each in three subjects and the six hour basic course in the fourth.)

(f) Certification for general science should require broad preparation including college courses in all the subjects concerned in general science. The prospective general science teacher should meet the requirements suggested above and in addition should complete a one semester basic course in astronomy and in geology.⁸

A national study by the National Education Association Research Division (1959) was reported on by Smith and Homman. The study showed that out of 5,200 science teachers questioned, 49.3 per cent were full time teachers of science. Five per cent had nine or less hours in science and .3 per cent had no training at all. Also, between 21 and 22 per cent had less than twenty credit hours in the science fields. The authors further stated that the figures indicated a better situation than actually existed because the figures do not consider the appropriateness of the person's science background to his teaching position.⁹

Finally, Smith and Homman concluded that the four year bachelors degree program is becoming less and less adequate as preliminary training for secondary science

⁸Science and Public Policy, Vol. 4, p. 59, cited by G. P. Cahoon, "Teaching Science for General Education in the Secondary School," School Science and Math, 49:287, April, 1949.

⁹Herbert A. Smith and Guy B. Homman, "The Academic and Professional Preparation of Teachers of Science," Review of Educational Research, 31:291, June, 1961.

teaching.¹⁰

In 1960 Gardner and Richardson found much the same situation in Ohio as the NEA study had found at the national level. They reported that out of 2,222 teachers of science, 5 per cent of biology teachers, 7 per cent of chemistry teachers, and 10 per cent of physics teachers had no credit in their teaching area. Even with this situation existing, 35 per cent of the teachers had earned a Master's degree.¹¹

Koelsche also made a study of Ohio science teachers. Using the Principals Reports of 1957-8, questionnaires, and transcripts, in an 18 per cent sample of the schools he found the full time biology and general science teachers were considerably better prepared than the part time teachers in the two subjects. Further, he reported that the general science teachers had an average depth of thirty-six semester hours of science. The biology teachers averaged thirty-three credit hours in the field and twenty-four in biology.¹²

¹⁰Ibid., p. 294.

¹¹Marjorie Gardner and John S. Richardson, "The Teachers of Science in Ohio Senior High School," Educational Research Bulletin, 49:65-71, March, 1960.

¹²Charles R. Koelsche, "The Academy and Teaching Backgrounds of Secondary Science Teachers in the State of Ohio," Science Education, 43:135-6, March, 1959.

In a report by the National Association of State Directors of Teacher Evaluation and Certification, and the American Association for the Advancement of Science, the conclusions of a survey in 1961 which included 1,230 science teachers were stated. It was noted that 99 per cent of the teachers held Bachelors degrees, 29 per cent had Master's degrees, and many had substantial amounts of course work to their credit beyond that required for their Master's degree, but only 40 per cent had credit beyond the requirement in the subject they taught.¹³

Just why do teachers, especially those in science, often fail to take graduate work in their field? Possibly the answer as stated by Mallinson¹⁴ is first, that teachers do not specialize as much as people going into other fields, and secondly, that in teaching they often do not utilize their learnings from advanced courses and return to graduate school after a longer interval than those in other fields. Consequently, they are rusty in the know-

¹³National Association of State Directors of Teacher Evaluation and Certification and the American Association for the Advancement of Science, Secondary School Science and Mathematics Teachers Characteristics and Service Loads, 1963.

¹⁴George P. Mallinson (comp.), "Promising Practices in Science Teacher Education: A Report from the Midwest Regional State College Conference on Science and Mathematics Teacher Education," School Science and Math, 58:19, January, 1958.

ledge necessary for the graduate courses in their field so they take graduate work in a more familiar field such as education. Such action causes them to fall even more behind the times.

Also teachers often find a need to take work in a field in which they have little or no training, but learn that they must have undergraduate credit. So they again turn toward education courses that will count toward a degree.¹⁵

Thus, it would seem that colleges and universities have failed to meet the needs of science teachers in providing courses that will enable them to do a better job in teaching. However, an increasing number of colleges and universities have developed introductory courses for science teachers which carry graduate credit. These courses cover much more than typical introductory courses, demand much more from the student, and require considerable independent work. The courses are usually only applicable on a teaching degree in a science area but not on a liberal arts degree.¹⁶

Mallinson also mentions other in-service courses for science teachers such as "up-to-date" courses dealing with current developments and discoveries in a wide area

¹⁵Ibid., p. 294.

¹⁶Ibid., p. 20.

of science, and workshops containing lectures on modern advances in science, and where each student is expected to develop a report or project that will have direct application on his teaching assignment.¹⁷

It is hoped that colleges and universities will offer more of these types of courses and that science teachers will take advantage of them to keep up on the ever increasing knowledge in the science field.

ANALYSIS OF RESULTS

The data in the tables show that there were 689 biology and 789 general science teachers. The sum of these numbers is 1478. This total exceeds the total number of teachers that was given previously as being included in the study because there was duplication in counting. For example, a part time biology teacher might also teach general science part time and would thus be counted in both categories.

The data in Table I shows the distribution of size, number of teachers, and biology offerings of the secondary schools of Kansas in 1963-64. Of the total teachers, 39 per cent taught in schools with less than one hundred students and 18 per cent taught in schools of the 101-200 size. The next largest percentage, 15, taught in schools

¹⁷Ibid., pp. 20-21.

TABLE I

DISTRIBUTION OF SIZE, NUMBER OF TEACHERS AND BIOLOGY OFFERINGS
OF THE SECONDARY SCHOOLS OF KANSAS IN 1963-64

Size of school	Number of schools	Number of biology teachers	Per cent of total teachers*	Biology not offered	Biology offered on alternate years
Under 100	292	266	39	3	17
101-200	127	127	18	1	-
201-300	56	63	9	-	-
301-600	53	65	9	1	-
601-1000	23	63	9	-	-
1001 or more	26	105	15	6	-
Total	577	689	-	11	17

Note: this table does not count the number of junior high schools not offering biology since it is not normally offered until senior high.

of 1,001 or more students. Biology was not offered in twenty-eight of the schools in 1963-64, but was offered every two years in seventeen of these schools.

The data in Table II shows the distribution of size, number of teachers, and general science offerings of the schools studied. Again the schools with less than one hundred students had the highest percentage of teachers, with thirty-two per cent. In 1963-64 general science was not offered in ninety-two of the schools but in nine of these schools it was offered every two years.

The data showing the number of part time and full time biology and general science teachers were presented in Table III. In the schools of less than 301 students, the far greater per cent of teachers are part time. Above this size, the schools tend to have more full time than part time teachers as shown by the schools of over one thousand students where 80 per cent of the biology teachers were full time teachers, and by schools between 601-1,000 where 79 per cent were full time teachers.

A comparison of the average preparation of part and full time biology teachers and a comparison of the part and full time general science teachers is found in Table IV. The data shows that the full time biology teachers were generally better prepared than the part time teachers, and that the average preparation increased so that the teacher in schools with over one thousand students averaged

TABLE II

DISTRIBUTION OF SIZE, NUMBER OF TEACHERS, AND GENERAL
SCIENCE OFFERINGS OF THE SECONDARY SCHOOLS
OF KANSAS IN 1963-64

Size of school	Number of schools	Number of general science teachers	Per cent of total teachers*	Number of schools in which gen- eral science is not offered	General science offered on alternate years
Under 100	297	251	32	37	6
101-200	139	122	15	14	1
201-300	65	78	10	6	2
301-600	83	108	14	12	-
601-1000	57	143	18	8	-
1001 or more	35	87	11	6	-
Total	676	789	-	83	9

TABLE III

DISTRIBUTION OF THE NUMBER OF PART TIME AND FULL TIME
BIOLOGY AND GENERAL SCIENCE TEACHERS

Size of school	Biology Teachers		per cent		General Science Teachers		Per cent	
	PT	FT	PT	FT	PT	FT	PT	FT
Under 100	264	2	99	1	250	1	99	1
101-200	125	2	98	2	116	6	95	5
201-300	59	4	94	6	64	14	82	18
301-600	34	31	52	48	52	56	48	52
601-1000	30	33	48	52	30	113	21	79
1000 or more	21	84	20	80	40	47	46	54
Total	533	156	-	-	552	237	-	-

TABLE IV

COMPARISON OF THE AVERAGE PREPARATION IN BIOLOGY OF PART AND FULL TIME BIOLOGY
TEACHERS AND A COMPARISON OF THE AVERAGE PREPARATION IN THE TEACHING
FIELD OF PART AND FULL TIME GENERAL SCIENCE TEACHERS

Size of school	Average Credits in Biology		Average Credits in Science Field		
	Biology teachers	PT	PT	FT General science teachers	
Under 100		19	22	40	47
101-200		23	43	54	32
201-300		28	36	51	53
301-600		30	43	66	50
601-1000		32	52	48	62
1001-or more		30	53	59	53
Average		27	42	54	50

considerably more biology hours than did their counterparts in the smaller schools. The average for all part time teachers in biology is 27 credits as compared to 42 credits for the full time teachers.

The average credit in the field for general science teachers showed little if any correlation between school size and preparation, nor did the full time teachers generally have more hours of preparation. The data shows that the average preparation for all the part time general science teachers was 53 credits as compared with the average preparation of all full time general science teachers which was 49 credits.

While the average preparation for the part and full time teachers in biology as presented in Table IV is commendable when compared with other studies previously mentioned, the range of credits as listed in Table V is wide, indicating that there are teachers with very low preparation in biology, the science field, or both. The range for all part time biology teachers is from 3-106 credits in biology. The full time teachers had a range in biology credits from 8-122. In the science field the credits of the part time biology teachers ranged from 15-42 credits and the full time teachers ranged from 15-164 credits.

The biology teachers do not show an appreciable difference in the ranges between part and full time teachers in regard to the range, nor are they comparable to

TABLE V
 RANGE OF CREDITS FOR PART-TIME AND FULL-TIME
 BIOLOGY AND GENERAL SCIENCE TEACHERS

Size of School	Range of Credits in Biology		Range of Credits in Science (Biology Teachers)		Range of Credits in Science (General Science Teachers)	
	PT	FT	PT	FT	PT	FT
Under 100	3-80	17-28	15-142	35-50	7-142	-
101-200	3-77	30-57	19-130	45-99	18-130	29-50
201-300	6-91	19-53	24-141	32-53	13-141	31-74
301-600	8-76	10-105	23-108	25-127	16-127	20-103
601-1000	6-106	15-84	24-139	15-117	17-117	18-142
1000 or more	8-70	8-122	24-91	25-164	17-119	19-140

school size. However, the ranges of the part time biology teachers in credits in biology generally start lower than the ranges of the full time teachers. The total range of the part time teachers is 3-106 credits and for the full time teachers is 8-122.

Except for the part time general science teachers in schools with less than one hundred students, the ranges of the part time and full time general science teachers in the science field showed only slight differences. The range of the part time general science teachers in schools of less than one hundred was 7-142 credits. Otherwise, the greatest range was 13-141 credits for the part time teachers and 18-142 for the full time teachers.

The average number of credits in biology and in the teaching field in relation to size of school taught is shown by Figure 1. The figure shows a gradual rise in average credits in biology from nineteen in schools under one hundred to forty-eight in schools over one thousand. Similarly, an increase from an average of forty credits in the schools with less than one hundred students to seventy-one in schools with more than one thousand students was noted in the average preparation in the science field.

Using the Pearson product-moment correlation coefficient method¹⁸ which involved use of the averages in the

¹⁸George H. Weinberg and John A. Schumaker, Statistics An Intuitive Approach, pp. 259-266.

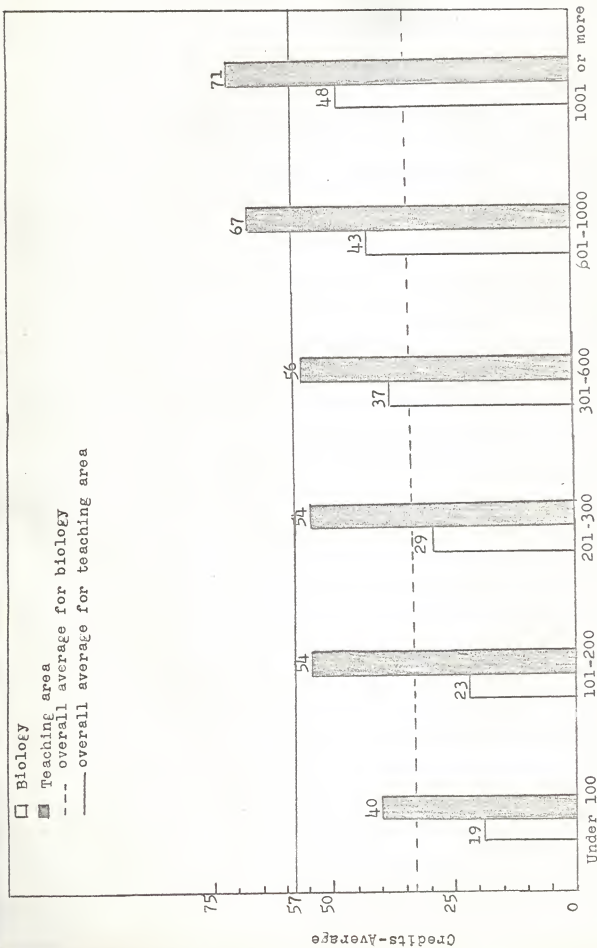


FIGURE I
THE AVERAGE NUMBER OF CREDITS IN BIOLOGY AND TEACHING
AREA ACCORDING TO SIZE OF SCHOOL

subject taught and in the field for the various school sizes and the mid-points of the intervals (school sizes) the relationship between the two groups of figures were computed. It was found that there was a correlation of .86 between average hours in biology and school size. There was a correlation of .82 between average hours in the field and school size.

On September 1, 1965 new and more demanding subject and field requirements go into effect for certification as a science teacher. They include, in part, for biology:

Standard: Twenty-four semester hours
in the field of science with twelve semester
hours in biology.

Minimum: Eighteen semester hours in
the field of science with ten semester hours
in biology.¹⁹

With the new certification requirements becoming effective, it would seem to be of value to see how many teachers fail to meet these requirements. The data in Table VI shows the number of biology teachers failing to meet minimum certification requirements in biology and the science field. The data indicate that in the schools of less than one hundred enrollment, there are eighty biology teachers (30 per cent) who fail to meet the new minimum for credit hours in biology (10). Thirteen biology teachers (5 per cent) in this group fail to meet the

¹⁹Kansas State Board of Education, op. cit., p. 65.

TABLE VI
NUMBER AND PER CENT OF BIOLOGY TEACHERS FAILING TO MEET MINIMUM CERTIFICATION
REQUIREMENTS IN BIOLOGY AND THE SCIENCE FIELD

Size of School	<u>Credits in Biology</u>		<u>Credits in Science</u>	
	less than 10 per cent*		less than 18 per cent	
Under 100	80	30	13	5
101-200	15	12	-	-
201-300	8	13	-	-
301-600	-	-	-	-
601-1000	1	2	-	-
1001 or more	3	3	-	-
Total	107	16**	13	2

*This figure refers to the per cent of teachers in the various school sizes and was computed using the numbers from Table I, example 80 \div 266 = .300 or 30 per cent.

**This figure refers to per cent of total biology teachers and was computed using the total from Table I, example 107 \div 689 = .155 or 16 per cent.

minimum credit hour requirements in the science field (18). Fifteen biology teachers (12 per cent) in the schools of enrollment 101-200 fail to meet the minimum credit hours in biology. As the school size increases, progressively fewer and fewer teachers fail to meet the new requirement. In the schools over one thousand there are only three teachers who fail to meet the minimum credit hour requirements in biology and none that fail to meet the minimum requirements in the science field. This data shows that the greatest majority of the teachers who fail to meet the new standards are found in the schools with less than 201 students enrolled. It also shows that 16 per cent of the total biology teachers in the state fail to meet the new standards for minimum credit hours in biology and 2 per cent fail to meet the minimum credit hours in the science field.

There appeared to be a relationship between the size of school and the number of teachers with Master's degrees as was evident from the data in Table VII. The biology teachers showed a gradual rise in the per cent of teachers earning the Master's degree as the school size increased from 19 per cent in schools of zero to one hundred enrollment, and to 48 per cent in schools over one thousand enrollment. Of all biology teachers studies, 36 per cent had earned a Master's degree.

The general science teachers also showed an increase

TABLE VII
DISTRIBUTION OF NUMBER OF TEACHERS WITH MASTER'S DEGREES

Size of School	<u>Biology</u>			<u>General Science</u>		
	No. of teachers	No. holding Master's	Per cent holding Master's	No. of teachers	No. holding Master's	Per cent holding Master's
Under 100	266	50	19	251	51	20
101-200	127	36	28	122	27	22
201-300	63	23	37	78	20	26
301-600	65	28	43	108	40	37
601-1000	63	25	40	143	55	38
1001 or more	105	50	48	87	30	34
Total	689	212 average	-36	789	223 average	-30

in the per cent of teachers with Master's degrees from the small schools to the large schools but it was not as regular as was the increase in the biology teachers. Twenty per cent of the general science teachers in schools of less than 101 had earned the degree and 34 per cent of the teachers in schools over 1,000 had earned the degree. The highest per cent of Master's degrees was found in the general science teachers in schools of 601-1000 enrollment. Thirty-eight per cent of them had earned Master's degrees. Thirty per cent of all general science teachers held Master's degrees.

SUMMARY AND CONCLUSIONS

The purpose of the study was to determine the number of college credits in biology and in the science field for the secondary biology teachers, and in the science field for general science teachers, in Kansas, and to compare the academic preparation to the size of school in which they teach. Information for the study was taken from the 1963-64 High School Principals Organizational Reports on file at the State Department of Public Instruction. A total of 1,190 biology and general science teachers were studied.

A summary of the data is as follows:

(1) Fifty-seven per cent of the biology teachers and 47 per cent of the general science teachers taught in schools within the enrollment group of zero to two hundred students.

(2) Eleven senior high schools did not offer biology and seventeen offered it on alternate years.

(3) Eighty-three schools did not offer general science and nine offered it on alternate years.

(4) By far the greatest per cent of biology and general science teachers in high schools under 301 enrollment are part time and in the largest schools half of the general science teachers and 80 per cent of the biology

teachers are full time teachers.

(5) There was a direct relationship between the size of school and the academic preparation of the biology teachers. The number of credits in biology increased from nineteen to forty-eight, and the credits in the science field from forty to seventy-one as the school size increased from zero to over one thousand students. The correlation between school size and average preparation of the biology teachers in the subject taught was .86. The correlation between school size and average preparation in the field was .82.

(6) The part time biology teachers showed much less academic preparation in biology than the full time biology teachers. The part time teachers averaged twenty-seven credits in biology and the full time teachers averaged forty-two credits.

(7) There seemed to be no relationship between school size and academic preparation of the general science teachers, nor were full time general science teachers better prepared than the part time general science teachers.

(8) The part time general science teachers averaged fifty-four credits in the science field and the full time general science teachers averaged fifty.

(9) The average biology teacher had thirty-three hours credit in biology and fifty-seven hours credit in the science field.

(10) The average general science teacher had fifty-two hours in the field of science.

(11) Thirty per cent of the teachers in the schools with enrollments from zero to one hundred failed to meet the minimum (10) credits in biology necessary for certification in 1965 and 5 per cent failed to meet the minimum (18) credits in the teaching field.

(12) Sixteen per cent of the total biology teachers failed to meet the minimum (10) biology credit requirements necessary for certification and 2 per cent of the total biology teachers failed to meet the minimum (18) requirements in the field of science.

(13) Thirty-six per cent of the biology teachers and 30 per cent of the general science teachers held Master's degrees.

From the study it can be concluded that there is a direct relationship between the school size and the academic preparation of the biology teachers. There seems to be no definite relationship between the general science teachers academic preparation and the size of school in which they teach.

While it is commendable that thirty per cent of the general science teachers hold Master's degrees, perhaps this is too optimistic a picture as far as an indication of their science preparation is concerned. Observation

has revealed that teachers with little more credit in the science field than is necessary for the Bachelor's degree, held Master's degrees. This would mean that the teachers are getting degrees outside of their subject field and thus are getting advanced in the salary schedule, but are not adding to their academic preparation for their teaching assignment.

Of value would be additional studies of possible inservice programs for additional academic preparation in the teacher's field. Also of value would be to make better known to secondary science teachers existing programs such as the one leading to the Master of Science in Physical Science Teaching offered at Kansas State University.

The academic preparation of the general science and biology teachers was high in comparison with studies mentioned earlier in this report, but there is still a considerable number of teachers with a rather low number of credit hours in their subject. As certification rules now stand, inservice teachers are not obligated to increase their preparation in either their subject or field as they continue their career in teaching; therefore, the acquisition of more credits is left up to the desires of the individual teacher.

Although it is realized that merely the number of credits in a teacher's subject or field does not necessarily make him a better or poorer teacher because the number

does not show spread or balance of preparation in various courses, it is felt that the number of hours of academic credits does have some bearing as to the adequacy of preparation of the teacher.

BIBLIOGRAPHY

BIBLIOGRAPHY

- Baker, Weldon N. and Merle E. Brooks. "Background and Academic Preparation of the Teachers of Science in the High Schools of Kansas 1955-56," The Emporia State Research Studies, 6:1-40, December, 1957.
- Gardner, Marjorie and John S. Richardson. "The Teachers of Science in Ohio Senior High School," Educational Research Bulletin, 39:65-71, March, 1960.
- Hurd, Paul De H., "Science Teachers for the New Era in Science," California Journal of Secondary Educators, 33:486-501, December, 1958.
- Irwin, Frank L. "A Comparative Study of the College Preparation, Teaching Combinations, Salaries of Kansas High School Administrators and Teachers," Kansas State Teachers College Bulletin of Information, 18:1-38.
- Kansas State Board of Education. Certificate Handbook. Topeka: State Printing Plant, July 1, 1963.
- Koelsche, Charles R. "The Academic and Teaching Backgrounds of Science Teachers in the State of Ohio," Science Education, 43:134-39, March, 1959.
- Lockard, Gene K. "A Comparative Study of the College Preparation, Teaching Combinations, and Salaries of Kansas High School Administrators and Teachers," Kansas State Teachers College Bulletin of Information, 26:1-38.
- National Association of State Directors of Teacher Evaluation and Certification and the American Association for the Advancement of Science. Secondary School Science and Mathematics, Characteristics and Service Loads. Washington, D. C.: United States Government Printing Office, 1963.
- Ridgway, C. W. "A Comparative Study of the Training and Teaching Combinations of Kansas High School Teachers," Kansas State Teachers College Bulletin of Information. No. 5, 1-31.

Smith, Herbert A. and Guy B. Homman. "The Academic and Professional Preparation of Teachers of Science," Review of Educational Research, 31:289-95, June, 1961.

Weinberg, George H. and John A. Schumaker. Statistics, An Intuitive Approach. Belmont, California: Wadsworth Publishing Company, Inc., 1962.

A STUDY OF ACADEMIC PREPARATION OF BIOLOGY AND
GENERAL SCIENCE TEACHERS IN RELATION
TO SCHOOL SIZE IN KANSAS
1963-64

by

Randol Rex Walker
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AN ABSTRACT OF A REPORT

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Major Professor

The purpose of this study was to determine the number of college credits in biology and in the science field for the secondary biology teachers and in the science field for general science teachers, in Kansas, and to compare the academic preparation to the size of school in which they teach. Information for the study was taken from the 1963-64 High School Principals Organizational Reports on file at the State Department of Public Instruction. A total of 1,190 biology and general science teachers were studied.

Fifty-seven per cent of the biology teachers and forty-seven per cent of the general science teachers taught in schools within the enrollment group of zero to two hundred students. Eleven senior high schools did not offer biology and seventeen offered it on alternate years. Eighty-three schools did not offer general science and nine offered it on alternate years.

By far the greatest per cent of biology and general science teachers in high schools under 301 enrollment are part-time teachers and in the largest schools half of the general science teachers and eighty per cent of the biology teachers are full-time teachers.

There was a direct relationship between the size of school and the academic preparation of the biology teachers. The number of credits in biology increased from

nineteen to forty-eight, and the credits in the science field increased from forty to seventy-one as the school size increased from zero to over one thousand students. The correlation between school size and credit hours in the subject taught was .86. The correlation between school size and credit hours in the field was .82. Part-time teachers averaged twenty-seven credits in biology and the full-time teachers averaged forty-two credits.

There seemed to be no relationship between school size and academic preparation of the general science teachers, nor were full-time general science teachers better prepared than the part-time general science teachers.

The average biology teacher had thirty-three hours credit in biology and fifty-seven hours credit in the science field. The average general science teacher had fifty-two hours in the field of science.

Thirty per cent of the teachers in the schools with enrollments from zero to one hundred failed to meet the September, 1965 minimum (10) credits in biology necessary for certification and five per cent failed to meet the minimum (18) credits in the teaching field. Sixteen per cent of the total biology teachers failed to meet the minimum (10) biology credit requirements necessary for certification and two per cent of the total biology teachers failed to meet the minimum (18) requirements in the field of science.

Thirty-six per cent of the biology teachers and thirty per cent of the general science teachers held Master's degrees. Although one-third of the biology and general science teachers had earned a Master's degree, the degree was not always in the subject field of their teaching assignment, and thus, did not necessarily improve their academic preparation in science.